In the Gulf States as a rule the highest temperatures occurred at the close of the first decade, 7th to 10th, the maxima ranging from 95° to over 100°. In Florida no definite periods of excessive warmth prevailed, the maxima occurring on scattered dates throughout the month. North of Georgia there was a second brief period of excessive heat, culminating on the 17th. In Virginia the most marked positive departures in temperature occurred from the 8th to the 11th. Maximum temperatures of 100° or above occurred at 10 places in North Carolina and at 12 in South Carolina, but at comparatively few places in other States in the district. The lowest temperatures occurred quite generally at the beginning of the third decade, 20th to 24th, but at a few places in Florida the lowest were registered on the 1st, and in Mississippi and Alabama the 30th and 31st were the coolest days of the month. Minimum temperatures generally ranged between 50° and 60°, falling below 50° at but one point in Virginia.

The mean temperature for the entire district was 79.2° and the departure +0.3°. The State averages were very uniform, ranging only from 77° for the Virginia area to 81° for Florida. The highest local monthly mean was 83.4° at Blakely, Ga., and the lowest was 68.7° at Hot Springs, Va. The highest temperature for the district was 105° at Blakely, Ga., on the 7th, and the lowest was 43° on the 20th at Hot Springs, Va.

PRECIPITATION.

The distribution of precipitation for the month was extremely irregular, but more generallly abundant over large portions of the district than for many months past, and over limited areas the amounts were very large. All States in the district show an average in excess of the normal except South Carolina, where there was a small deficiency. The State averages ranged quite uniformly between 6 and 6.30 inches, except in Alabama and Florida, where they were 4.94 and 9.01 inches, respectively. As compared with August in previous years since 1892, in Florida the current month was the wettest with three exceptions, namely, in 1898, 1901, and 1905. The small regions of marked deficiency in rainfall are found in northern Alabama, north-central Georgia, and in portions of South Carolina bordering the upper course of the Savannah River, where the amounts received were slightly under 2 inches.

The most important facts with reference to the precipitation for the month are the unusually large amounts for the month at a few individual stations and the heavy local rains produced mainly by the two pronounced atmospheric disturbances to which reference has already been made. Over a considerable area in northern Florida and in a small region just north of Tampa the monthly rainfall exceeded 10 inches at 22 stations, with the maximum amount 17.73 inches at Macclenny, Fla. The rainfall generally exceeded 8 inches in southeastern Georgia, with 4 stations reporting more than 16 inches and 2 over 20 inches. The record for St. George, Ga., 24.17 inches, is with one exception (Fleming, Ga., Aug., 1898, 28.60 inches) the greatest monthly rainfall on record for Georgia during the period 1891 to 1911. A few stations in each of the other States in the district also received over 10 inches. The total at Wilmington, N. C., 13.85 inches, is the largest amount received in August during the past 40 years, excepting August, 1903, when 14.35 inches fell. The large amount at Wilmington, however, was due to heavy downpours on the 4th to 5th and 20th.

RIVER CONDITIONS.

Very heavy rains at points in southern Georgia, particularly in the lower valley of the Ocmulgee River near Lumber City, caused a rapid rise to above the flood stage at that place on the last day of August. The rainfall at Lumber City on the 29th was 4.15 inches and on the 30th 9.37 inches with a river stage of 10.3 feet. Warnings were issued at once by the official in charge of the Weather Bureau office at Macon, Ga., for the Altamaha and lower Ocmulgee Rivers. On August 31 the stage at Lumber City was 17.2 feet (flood stage 15 feet) and considerable damage was done in the vicinity. Bridges were swept away, washouts occurred on the railroads and country roads, and crops were damaged. The loss is estimated at about $20,000. The river subsided rapidly.

River conditions in other portions of the district presented no features of special interest, except that extremely low mean stages were maintained by all the rivers. In a few cases the mean stages for August, 1911, were the lowest for the month in many years, and at almost every river station the mean stages were below the normal.

MISCELLANEOUS PHENOMENA.

The prevailing direction of the wind was southwest in the Carolinas; south in Virginia, Georgia, and Mississippi; southeast in Florida; and east in Alabama. The wind movement was much greater than usual for August, the average hourly velocity being above 11 miles at Hatteras, Charleston, Savannah, and Pensacola. During the severe storm on the 11th, Pensacola experienced a velocity of 80 miles an hour from the southeast and during the hurricane of August 27–28, Charleston reported 94 miles (estimated maximum 106 miles) from the east and Savannah 88 miles from the northwest. The average number of clear days for the district was 12, partly cloudy days 11, cloudy days 8, and days with appreciable rainfall 12. Thunderstorms were numerous but generally of moderate force and there was very little hail. One man was killed by lightning at St. Petersburg, Fla., on August 9.

A waterspout of unusually large dimensions was reported by Capt. I. K. Chichester of the Clyde Line steamer *Arapahoe* to have been observed off Cape Romain, S. C., on Sunday morning, August 20, at 8.30 a. m.

THE SMALL HURRICANE OF AUGUST 11-12, 1911, AT PENSACOLA, FLA.

By W. F. REED, Jr., observer, Weather Bureau.

On the morning of August 9, 1911, a moderate atmospheric depression was evident in the east Gulf which, advancing slowly northward, appeared as a distinct disturbance between Burwood, near the mouth of the Mississippi River, and Pensacola on the morning of the 11th. The atmospheric pressure at Pensacola fell slowly from 29.95 inches at 11 a. m. to 29.73 inches at 5 p. m., the lowest pressure attained, and the 7 p. m. weather map revealed that the storm was then central between Pensacola and Mobile, with pressures of 29.78 and 29.75 inches, respectively, while the pressure at stations to the northeast was over 30.1 inches, giving a fairly steep gradient. Southeast storm warnings were displayed at 3 p. m. at Pensacola.

Moderate northeast winds prevailed to 1 p. m.; the wind shifted to southeast at 3.45 p. m., increasing in

velocity and reaching 64 miles an hour at 3.57 p. m.; the maximum 5-minute velocity between 4 and 5 p. m. was 78 miles an hour and at 5.48 p. m. a maximum of 80 miles was registered. The wind decreased to 24 miles an hour at 6.49 p. m., when the clouds began to break in the west, indicating the passage of the eye of the storm some distance west of Pensacola. Threatening, rainy weather with high southeast winds prevailed again from 8 p. m. to 12 midnight, reaching a maximum of 64 miles an hour. Excessive rain began at 4.04 p. m. and ended at 6.20 p. m., amount 2.73 inches; total precipitation on 11th and 12th, 4.48 inches.

The damage by this storm at Pensacola was less than expected. The wind was steady and did not come in severe puffs as during the hurricane of September 26, 1906. One-third of the roof of the Monarch pavilion on Santa Rosa Island was torn off, and also a few portions of old roofs in the city. The British steamship *Durham*, at anchor in the harbor, drifted into shoal water, but steamed out safely on the morning of the 12th. About 12 barges dragged anchors and grounded, some small launches and fishing smacks were wrecked, and some coal barges belonging to the navy yard went ashore. In the city telegraph and telephone lines were blown down and the street car and electric light services were interrupted. The damage at Pensacola is conservatively estimated as follows: To electric lines, $500; local lumber interests, $500; to launches, barges, etc., $3,000; fishing smacks, $2,500; loss of coal belonging to navy yard, $1,100; total, $12,600.

The highest wind at Mobile was 35 miles an hour and no damage resulted at that place. The storm drifted slowly westward to Louisiana and Texas on the 12th, with heavy rains causing some washouts. Rain and high southeast winds continued at Pensacola on the 12th, the wind becoming light after 4.35 p. m.

THE HURRICANE OF AUGUST 27–29, 1911.

The Charleston-Savannah hurricane of August 27–29, 1911, was characterized by its relatively small diameter but intense energy, its unusual path directly from east to west, and its rapid loss of power after entering the coast line. Advancing from the ocean where no meteorological observations are possible the only indication given of its approach was the low and decreasing atmospheric pressure at Charleston and Savannah on the morning of August 27, and the rapidly increasing winds; nevertheless storm warnings were displayed in both cities by about noon on the 27th, and hurricane warnings at 4.12 p. m. at Charleston and at 5 p. m. at Savannah. As the day was Sunday both offices were greatly hampered in the work of disseminating the warnings, although all means at hand—the telephone, the telegraph, signal flags, and rocket—were utilized as far as possible. The descriptions of the storm prepared by Mr. H. B. Boyer, of the Weather Bureau at Savannah, and Mr. H. S. Cole, at Charleston, indicate the tremendous force capable of being exerted by air in motion and the destruction wrought by the warring elements.

Remembering that the trend of the Atlantic coast line between Charleston and Savannah is exactly northeast to southwest, and that Charleston is thus 65 miles east of Savannah as well as 50 miles north the data available enable a fairly accurate computation of the rate of movement of the entire storm, which, of course, is quite a distinct matter from the velocity of the winds blowing into it, and of the diameter of a chosen isobar. At Charleston the lowest pressure, 29.30 inches, occurred at 11.50 p. m., August 27, wind southeast; at Savannah it was 29.02 inches at 8 a. m., August 28, wind northwest. Assuming that the storm traveled in a straight line from east to west, the trough of low pressure required 9 hours to traverse 65 miles, indicating a velocity of translation of only 7.2 miles an hour. The diameter of the isobar of 29.30 inches surrounding the storm was approximately 100 miles. The center or eye of the storm passed a few miles north of Savannah, where for two hours, from 8.10 a. m. to 10.10 a. m., the 28th, the pressure remained lowest and the wind decreased to only 20 miles an hour. The eye of the storm was about 14 or 15 miles in diameter. At Savannah the wind backed from northwest to south about 10 a. m., the 28th, and the wind again increased suddenly in velocity, heavy rain began, and the pressure rose rapidly. At Charleston the wind veered from northeast to east and southeast, and the destruction of property was much greater than at Savannah because the winds were onshore. At Charleston the damage to property is estimated to have exceeded $1,000,000 and 17 lives were lost. The damage at Savannah was of a minor nature though large in the aggregate.

The storm drifted slowly to southeastern Georgia on the 29th, with the pressure below 29.70 inches, and was accompanied by exceptionally heavy rains near the coast of Georgia, where much damage was done to crops and live stock and numerous washouts occurred on the railroads. County roads suffered and many bridges were washed away.

The following extract from the report by Mr. H. S. Cole, local forecaster at Charleston, S. C., is of interest:

> The barometer continued to fall slowly during the forenoon of August 27, and the wind increased in force from the north, attaining a velocity of 46 miles an hour. At 4.30 p. m. the wind shifted to northeast and the pressure decreased more rapidly, and the wind soon attained hurricane force. At 6.50 p. m. the velocity was 60 miles an hour, at 8.40 p. m. 68 miles, at 9.15 p. m. 72, and at 9.45 p. m. 86. The wind shifted to east or nearly directly on-shore at 11.05 and at 11.20 was blowing with a velocity of 94 miles an hour when the anemometer ceased to properly record. After 11.20 the wind became southeast and was estimated to have attained a velocity of 106 miles an hour. It continued to blow steadily from the southeast all of next day (28th), remaining above 50 miles an hour most of the forenoon, and not falling below 36 miles an hour until after 4. a m. of the 29th. At the moment when the wind shifted to east, 11.05 p. m. 27th, the barometer rose rapidly 0.06 inch, then resumed its rapid fall and reached its lowest point, 29.30 inches, at 11.50 p. m.
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> Great damage was done by the wind. The electric light and street car services gave out at 8 p. m. and the telephone system was useless after 8.15 p. m. Soon after this tin roofs began to be blown off and hundreds of houses were unroofed and chimneys blown down. A great many windows and display signs were broken. The streets were a tangle of fallen trees and wires. Many houses were destroyed and 4 persons were killed by falling walls and 13 were drowned.
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> After the high tide on the morning of the 27th the sea began to rise and at the high tide that night reached a point 10.6 feet above mean low water, or somewhat lower than the tide of 1893. A great deal of damage was done by water in the wholesale districts and in other low portions of the city. The water front next day was a confused mass of wrecked vessels and damaged wharfs. The heavy rain increased the damage by flooding unroofed houses. The total rainfall for 3 days was 4.90 inches. The area of greatest destruction lay in the vicinity of Charleston and along the coast to the southwest. The estimated loss at Charleston was over $1,000,000.

The hurricane was not so destructive at Savannah, although the center passed nearly over that city. The following extract from Mr. H. B. Boyer's narrative will complete the picture of this dramatic event:

> In point of violence the storm that swept over Savannah and contiguous territory on August 27 and 28 was the worst in the history of the local station of the Weather Bureau, the wind attaining a maximum (5 minute) velocity of 88 miles an hour shortly after 3 a. m. on August 28, with an extreme (1 mile) velocity of 96 miles an hour at 3.08 a. m. during one of the terrific gusts.

During the early morning of the 27th the sky had been overcast with cirro-stratus clouds moving from the northeast, the wind was northwest, about 20 miles an hour, and the pressure was 29.91 and slowly falling. The barometer began to fall rapidly about 10 a. m., the wind freshened, and lower clouds began to appear. Light rain fell from 2.15 to 2.58 p. m. The wind at 2.20 p. m. abruptly dropped from a velocity of 38 miles an hour to merely a fresh breeze, and coincident with this the barometer began to rise until the rain ended, then resuming its rapid fall. Conditions now became more threatening. The barometer at 8 p. m. was 29.71 inches and began to fall with extreme rapidity. The wind reached 62 miles an hour at 11.40 p. m., still blowing from the northwest with strong gusts, and at midnight the pressure registered 29.50 inches. The wind attained a velocity of 66 miles an hour at 12.05 a. m. August 28, 74 miles at 1.40 a. m., 78 at 2.45 a. m., and between 3.05 and 3.10 a. m. it reached its maximum force of 88 miles an hour from the northwest. From 3 a. m. to 6.05 a. m. the wind maintained a velocity ranging between 80 and 90 miles an hour from the northwest, accompanied by light rain, which set in about 2. a. m. At 8 a. m. the lowest pressure, 29.02 inches, was recorded, the wind diminished with astonishing quickness, and from 8.10 to 10.10 a. m. the vortex of the storm passed practically over Savannah, the wind dying down to 20 miles an hour and shifting to south about 10 a. m. Immediately after the shift of the wind its velocity rapidly increased and the rainfall became heavier. The highest velocity attained after the passage of the center was 64 miles an hour at 11.30 a. m. and at 12.05 p. m. Throughout the afternoon of the 28th the rain fell incessantly and the weather continued wild and threatening. The rain ceased about 1.45 a. m. of the 29th, and the wind fell below the verifying velocity of 36 miles at 2.10 a. m.

Considering the severity of the storm it is remarkable that the damage in the city of Savannah and contiguous territory was not larger. No lives were lost, and while the aggregate property loss was large, the damage done was mostly of minor nature. There was scarcely a house in the city that escaped damage of some sort. The streets were littered with trees and fences, and the telegraph, telephone, street railway and electric light companies suffered severely. But singular to relate, there was little or no unroofing of dwellings. Small craft in the river and at nearby resorts suffered greatly. That the storm was not more destructive on the water front was due to the fact that the wind was westerly and southerly and not at any time from the east. The hotel and residences on Tybee Island were greatly damaged.

All but one of the large vessels that encountered the storm, the steamships *Cretan* of the Merchants & Miners' Transportation Co., the Clyde liner *Apache*, the *City of Montgomery*, and the *City of Savannah* weathered the storm and arrived in port safely. The steamship *Lexington* was driven ashore near the mouth of the Edisto River on the north side of the storm center, where the winds were from the east. The passengers and members of the crew were all saved. Mr. Boyer states that this vessel put to sea in the face of the warnings telephoned to the agent's office at the dock fully three-quarters of an hour before she sailed and that the vessel passed in plain view of the hurricane signal displayed over the local office of the Weather Bureau and at the display station at Tybee Island. Considerable damage to property occurred at Beaufort and Port Royal, S. C., but no lives were lost. Subsequent heavy rains caused great damage to crops in the coastal region of Georgia.

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THE EXCESSIVE RAINFALL AT ST. GEORGE, GA., ON AUGUST 28–29, 1911.

A remarkably heavy rainfall of 18 inches in about 17 hours occurred at St. George, Ga., in the extreme southeastern corner of the State, on the afternoon and night of August 28, which is worthy of note. Mr. A. N. Lund, the very reliable cooperative observer at that place, states that the rain began at 2 p. m., but that the greater quantity of the water fell between 8 and 8.30 p. m., 28th, continuing lightly during the early morning of the 29th, and was measured at 7 a. m. The measurement is believed to have been correctly made. After taking out the inner tube of the rain gauge, which was full, giving 2 inches of precipitation, the water in the overflow cylinder measured 16 inches in depth, or a total of 18 inches for the storm. Mr. Lund says:

> The rainfall was something extraordinary. This is a flat, low country, and the water came up to the level of the piney woods deep enough to float large logs which were shifted about by the action of the wind. I was driven out of bed at 10.30 p. m. by the rain blowing under the shingles, and looking out saw that the surrounding country was one vast sea of water, without land in sight as far as one could see. In the morning our garden fence was drifted full of ties from the nearby railroad track, where they had been piled for shipment. At a place where a small gulley under the track had existed, the track was washed out for a distance of 30 feet. The gauge stood in an open space free from obstruction and had not been tampered with.

The maximum 24-hour fall on record at Atlanta, Ga., period 1879 to 1911, is 7.36 inches on March 29, 1886. On July 23, 1898, 4.30 inches fell in 51 minutes. The most remarkable rainfall in one day recorded in the United States is 21.4 inches at Alexandria, La., June 15–16, 1886. Another remarkable record is: Fort Clark, Tex., 18 inches on June 14–15, 1899, in 21 hours and 30 minutes. These rains can not compare, however, with the extraordinary downpours that occur in the Tropics.